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Device and method for ejecting an article from a  
blister pack

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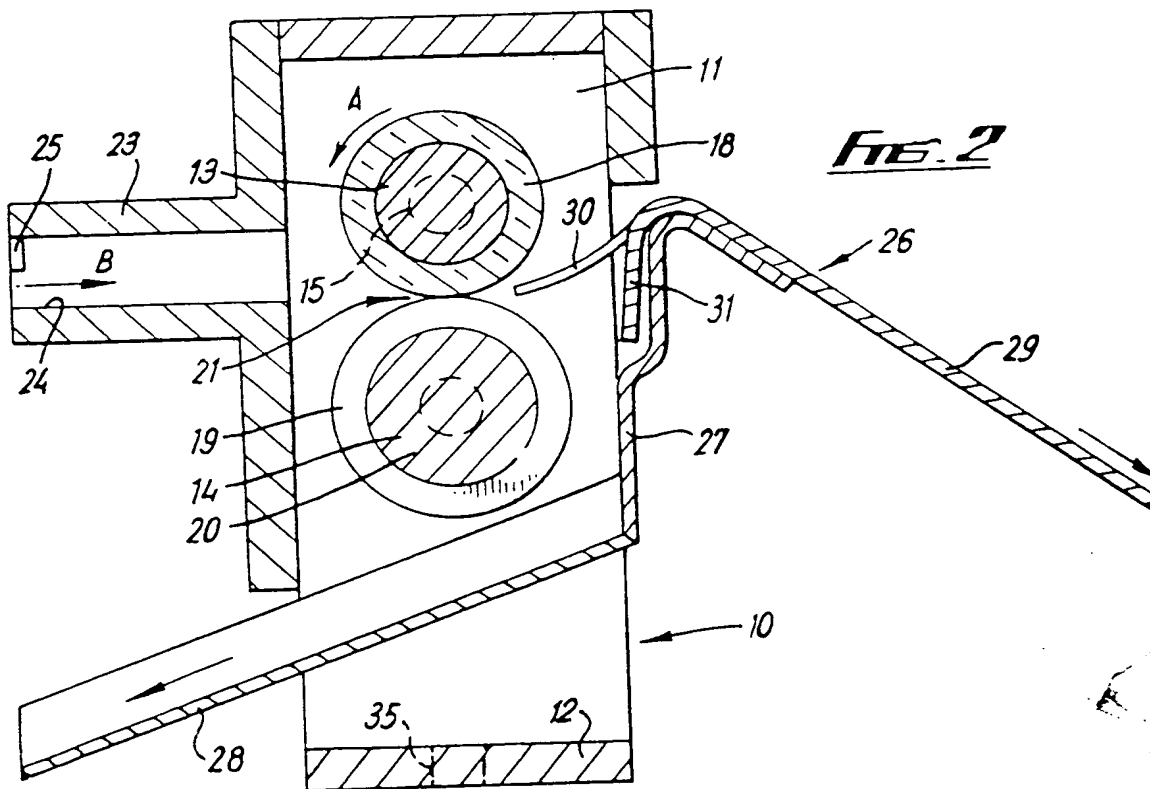
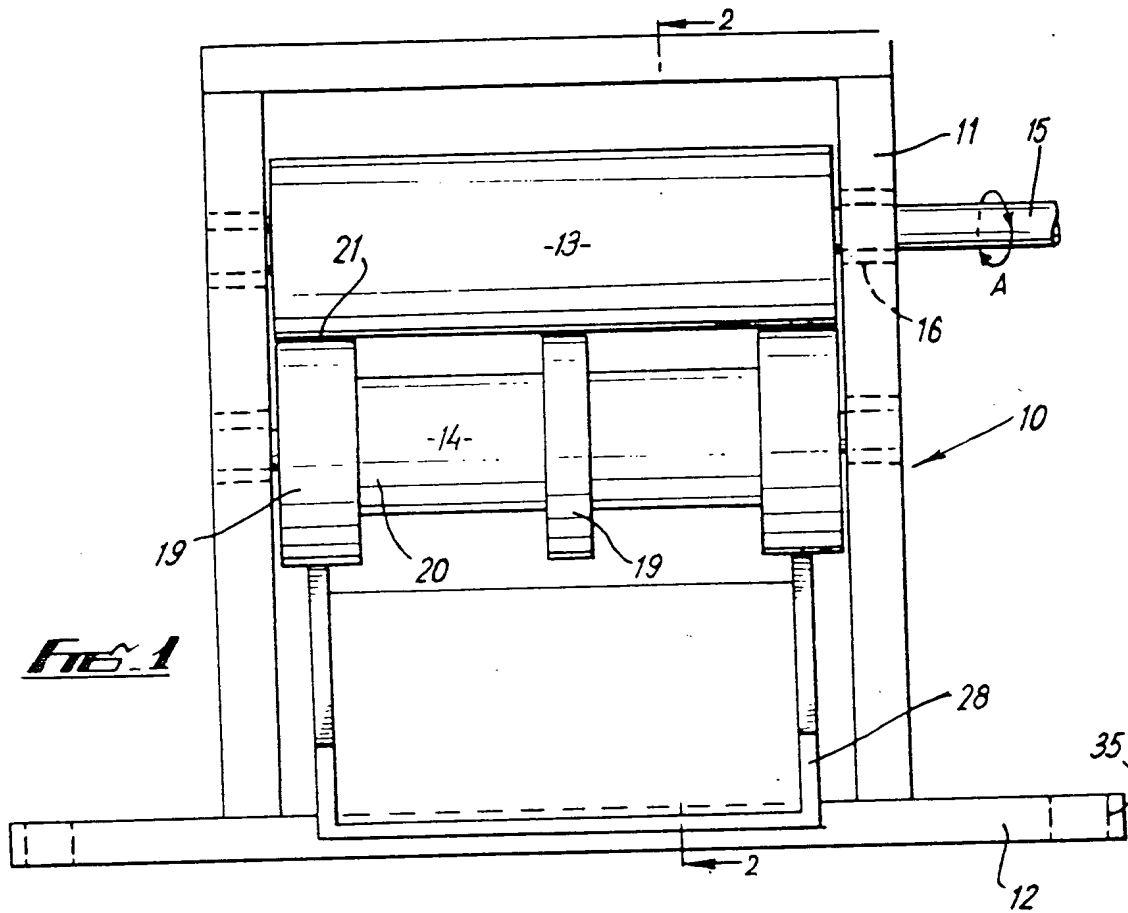
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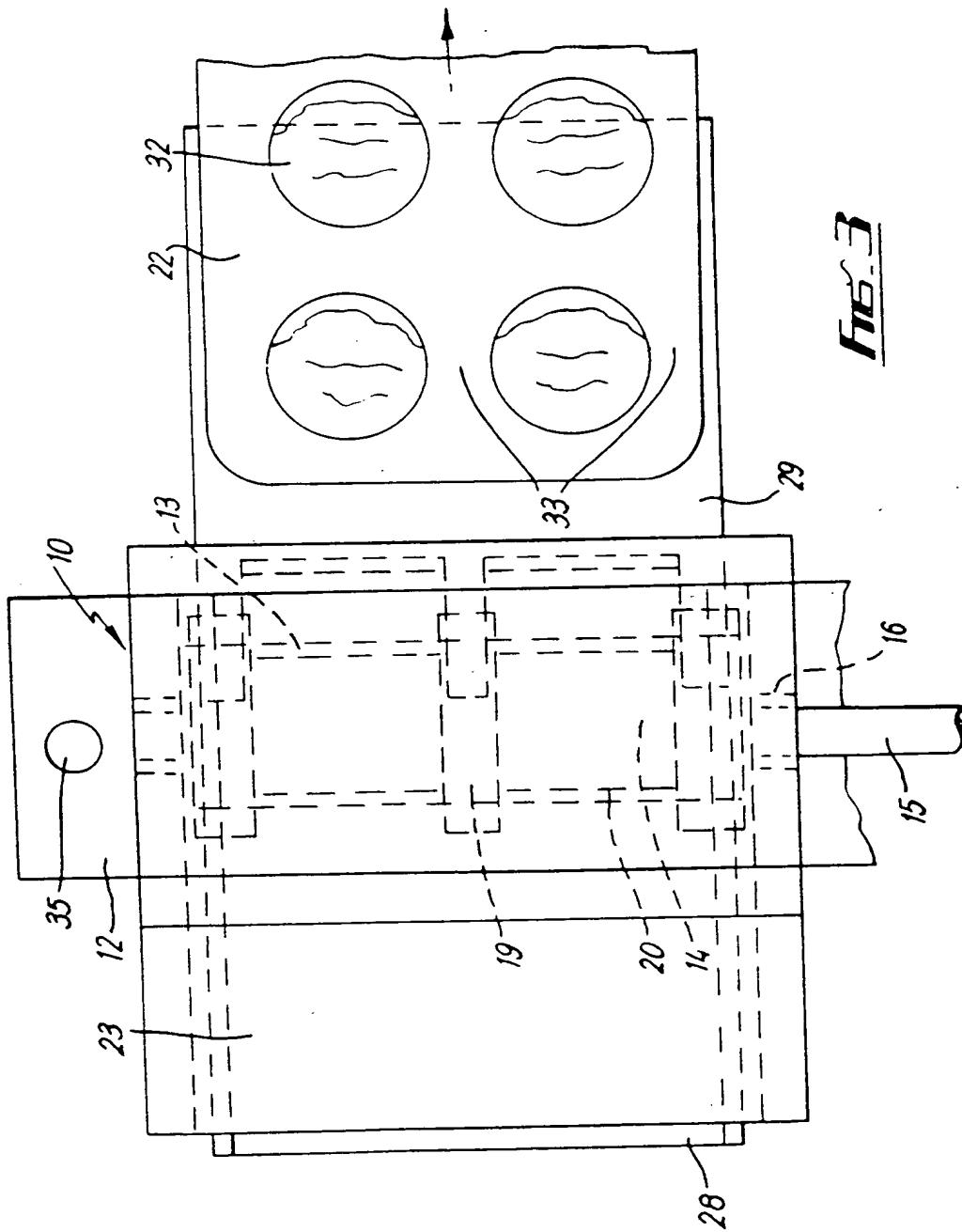
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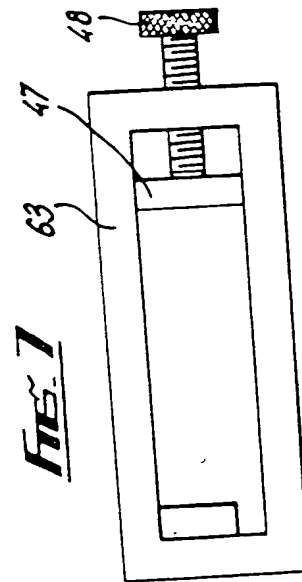
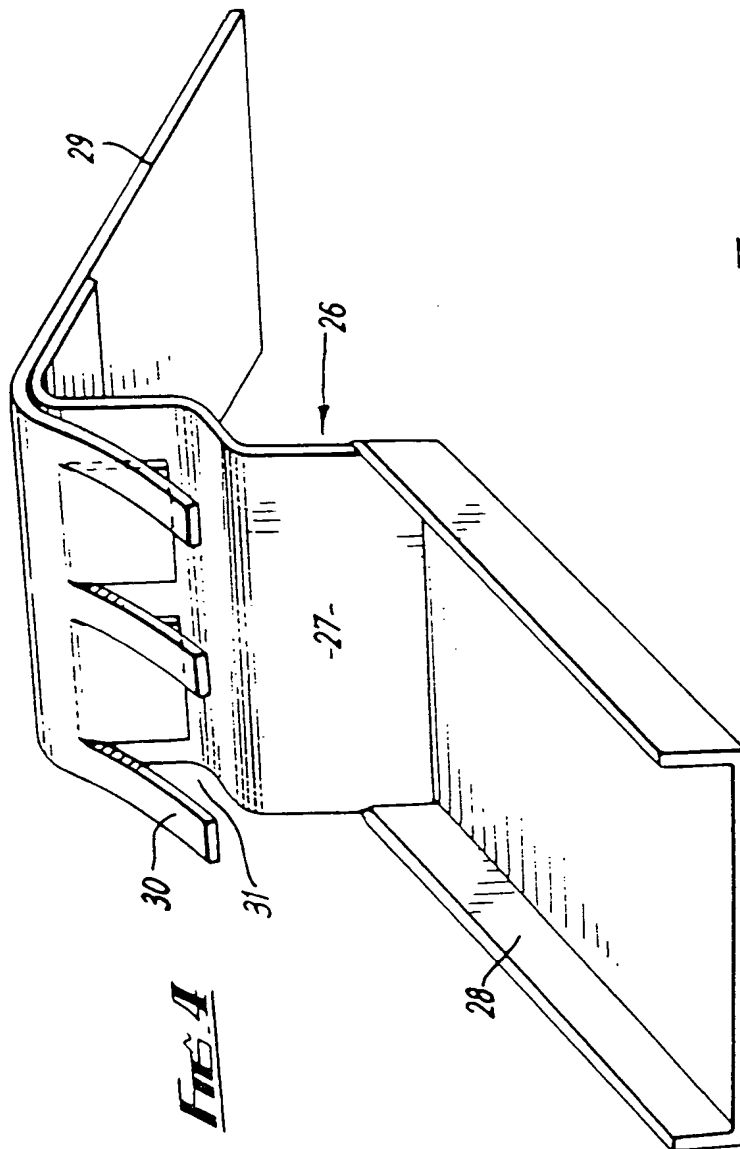
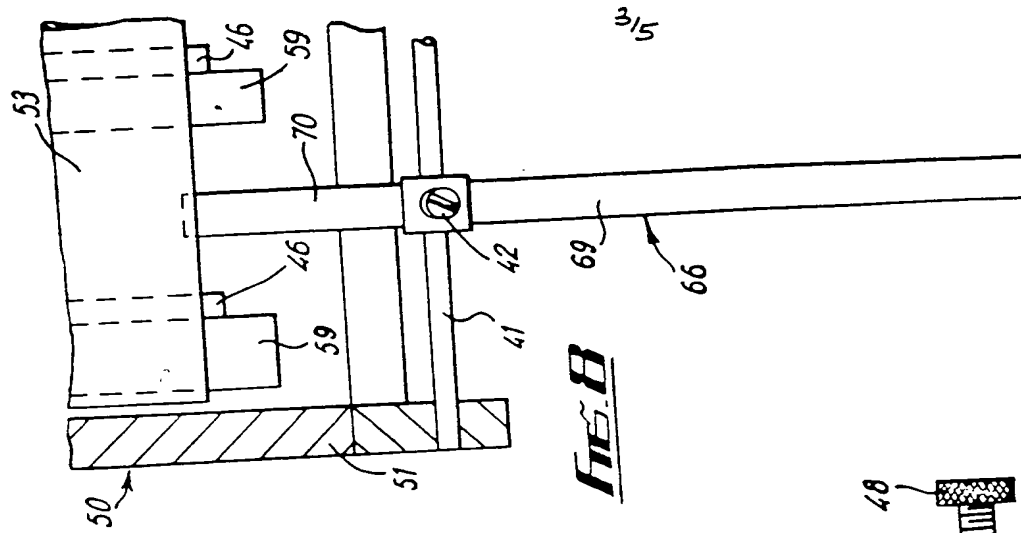


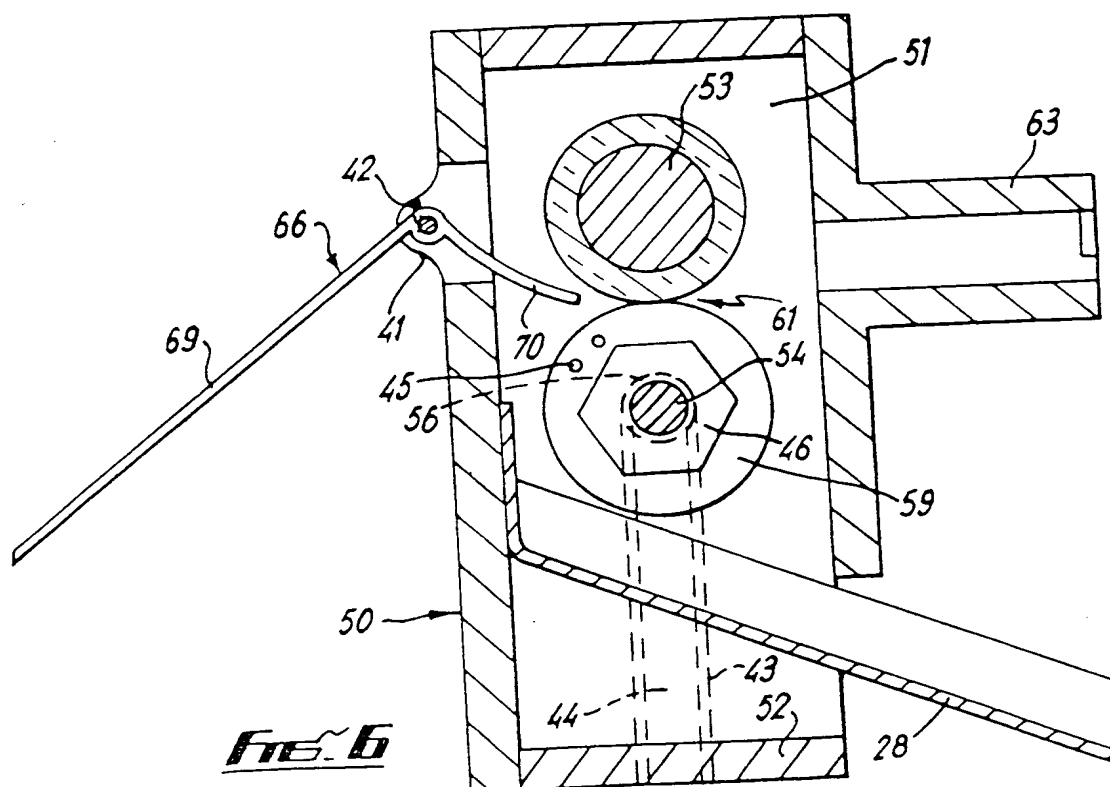
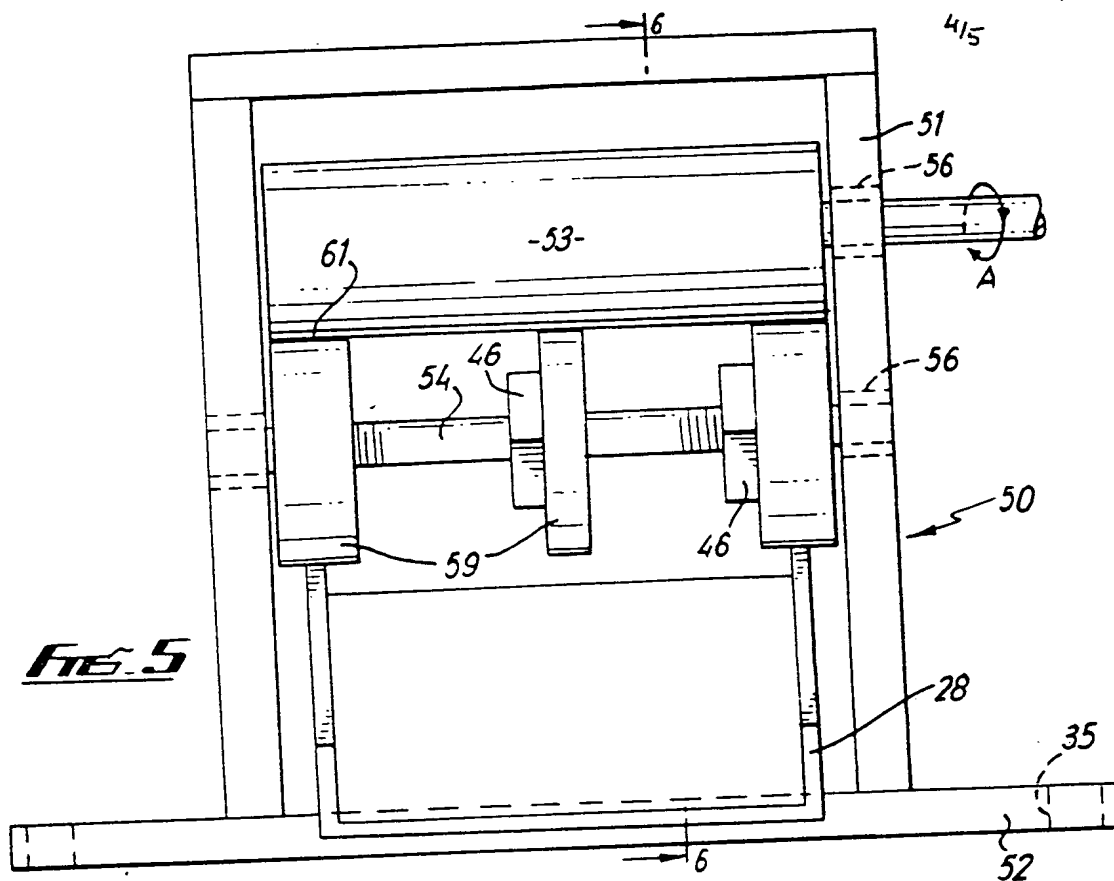
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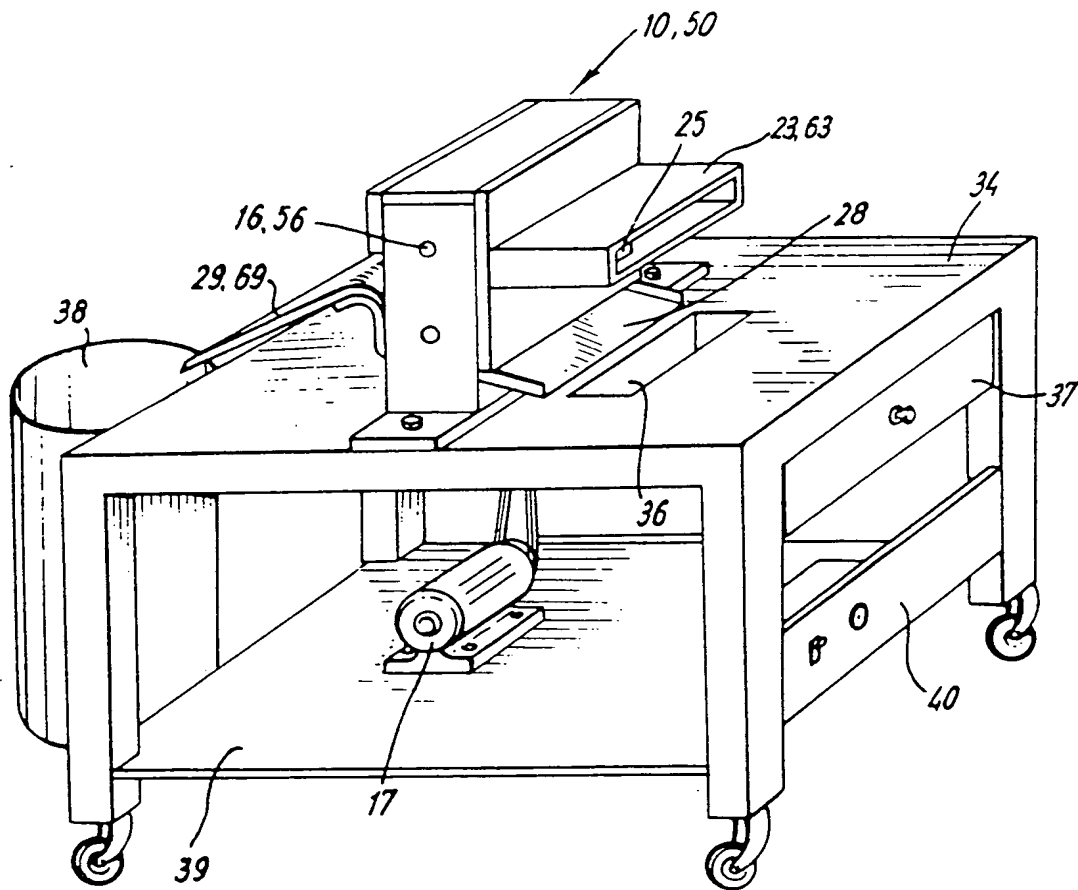


FIG. 9

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DEVICE AND METHOD FOR EJECTING AN  
ARTICLE FROM A BLISTER PACK.

This invention relates to apparatus and a method for ejecting a discrete article from a pack in which one or more such articles are enclosed. More particularly the invention relates to apparatus for ejecting a discrete article such as a capsule, tablet and the like, especially pharmaceutical such article, from a pack which may contain a plurality of such discrete articles, each individually contained in a blister. Such packs are known as blister packs and comprise a sculptured sheet of plastics material, so formed as to provide a plurality of depressions in each of which an article may be retained, and a sealing foil secured to the plastics sheet so as to seal each of said depressions and retain the article therein.

Such blister packs are being used for the packaging of an increasing number of products and in particular are used extensively for the packaging of pharmaceutical products such as capsules or tablets. Packaging of products in this manner readily lends itself to production-line techniques and the resulting packs are inspected for faulty packaging. Faults causing rejection of a pack may be the absence of a product in one or more of the blisters, a faulty article in one or more of the blisters or an incorrectly formed pack. A pack having such a fault may be despatched to waste, but this is costly in terms of the wasted product as well as the wasted package material. It is therefore

desirable that the product be retrieved from the pack for repackaging.

Manual removal of each capsule or tablet from a faulty pack is time consuming and labour intensive, and in consequence very costly. In consequence unless the product is expensive it may be more cost effective to reject the pack and product rather than to retrieve the product manually.

It has been proposed to use a punch device to remove the product from a faulty pack. Such punch devices may be relatively simple and inexpensive, manually operated devices or may be relatively complex, and in consequence expensive, powered machines. In the former case the retrieval operation is again time consuming and labour intensive, and a degree of skill is required to align each blister with the punch so as to avoid damaging the product. However it has been found that with such punch devices, simple or complex, a high proportion of the capsules or tablets, which although in a faulty pack are nevertheless satisfactory in themselves, are damaged and rendered unacceptable during the retrieval operation, particularly in the case of capsules which are often not as strong as the pack containing them.

It is an object of the present invention to provide a device which does not have the aforementioned disadvantages which is simple and inexpensive to produce, easy and quick



to use and does not damage an acceptable article.

5 The invention provides apparatus for ejecting a discrete article from a blister of a blister pack in which said article is enclosed, comprising rolling pressure means operable to apply pressure to one face of said pack progressively along the length of said pack whilst said pressure applying means rolls relative to said pack, and supporting means adapted to support the opposed face of said pack at laterally spaced locations, 10 and to support said pack in a longitudinally curved configuration whilst said pressure applying means applies pressure to said pack. Preferably the apparatus also comprises feed means adapted to feed said pack between said pressure applying means and said supporting 15 means.

The invention also provides a method of ejecting a discrete article from a blister disposed at one face of a blister pack in which said article is enclosed, comprising applying pressure to said one face of said 20 pack progressively along the length of said pack by means of rolling pressure means and supporting the opposed face of said pack at laterally spaced locations in a longitudinally curved configuration as said pressure means rolls in engagement with said pack.

25 The invention also provides a method of ejecting a discrete article from a blister of a pack having a

plurality of blisters at one face thereof in which blister said article is enclosed, comprising applying pressure to said pack at said one face progressively along the length of said pack by means of rolling

- 5 pressure means and supporting the opposed face of said pack at laterally spaced locations between said blisters in a longitudinally curved configuration as said pressing means rolls in engagement with said pack.

The pressure applying means may comprise a roller.  
10 of a resilient material  
or with an outer sleeve of a resilient material. The pressure applying roller may be rotatably driven whereby it provides the aforesaid feed means. The roller may be driven manually or by means of a motor.

- 15 The supporting and guiding means may comprise a stepped support roller whereby the pack is supported at locations in contact with the larger diameter portions of the support roller and is unsupported at locations adjacent the smaller diameter portions.

- 20 Preferably the support roller is of a rigid material and the axial spacing between successive large diameter portions of the support roller

preferably is chosen so as to be substantially equal to the lateral dimension of the blisters of the pack for which it is intended that the apparatus be used. The support roller may be mounted in the apparatus so as to be  
5 freely rotatable about an axis parallel with the axis of rotation of the pressure roller, whereby the support and pressure rollers provide a nip through which the pack may be fed.

The supporting and guiding means may comprise a  
10 plurality of supporting rollers mounted on a common shaft and means adapted to locate at least one of said supporting rollers at a predetermined location axially of said shaft. Said shaft may be threaded and at least one of said supporting rollers may then be  
15 provided with an internally cooperatingly threaded axial bore therethrough. A locknut may be provided in respect of the or each threaded supporting roller whereby said roller or rollers may be secured axially of said shaft. The or each threaded supporting roller may be provided  
20 with formations, preferably two or more recesses, adapted to receive spanner device, for example pins thereof.

The supporting and guiding means may comprise a curved plate extending towards the downstream side of the pressure applying means and the plate may have at least  
25 one aperture or slot therein. Alternatively the guide means may comprise a plurality of curved fingers mounted

in spaced side-by-side disposition. By this means the product, having been ejected from the pack, may pass through said aperture or slot or between said fingers respectively. A chute may be provided whereby the  
5 products passing through the guide means may slide freely to a product collecting receptacle or to transporting means for transportation of the product to packaging apparatus for repackaging.

A further chute may be provided whereby packs,  
10 having had the products ejected therefrom, may slide freely to waste collecting receptacle.

The apparatus may be provided with means for varying the width of the inlet. Such means may comprise a sidewall which is movable relative to an opposed side-  
15 wall. A screw may be provided for effecting such movement.

The apparatus may also be provided with means for varying the relative spacing of the guiding fingers. Each finger may be slidably mounted on a rod secured to  
20 the frame of the apparatus. A locking screw may be provided whereby the position of the finger axially of said rod may be secured.

The apparatus may be adapted so as to allow for the relative movement between the support roller or  
25 rollers and the pressure applying means towards and away from each other. Preferably the support roller or

rollers is movable relative to the pressure applying means and a frame of the apparatus. Bearings in which the shaft of the support roller or rollers is mounted may be slidably mounted in said frame and further  
5 pressure applying means may bias said support roller or rollers towards said pressure means. The further pressure applying means may comprise slidable blocks and/or springs or screws.

The invention will now be further described with  
10 reference to the accompanying drawings in which:-

Fig. 1 is a front elevation of one embodiment of apparatus according to the invention with the front removed;

15 Fig. 2 is a section of side elevation along the line 2-2 of Fig. 1;

Fig. 3 is a plan view of the apparatus of Figs. 1 and 2;

Fig. 4 is a perspective view of the guide assembly of the apparatus of Figs. 1 to 3;

20 Fig. 5 is a front elevation of an alternative embodiment with the front removed;

Fig. 6 is a sectional end elevation on line 6-6 of Fig. 5;

25 Fig. 7 is a scrap front elevation showing the inlet of the apparatus of Figs. 5 and 6;

Fig. 8 is a scrap sectional plan showing the

movable guide finger arrangement of the  
apparatus of Figs. 5 to 7; and

Fig. 9 is a perspective view of the apparatus  
mounted on a trolley.

5 In Figs. 1 to 4 the product ejecting apparatus is  
denoted generally by the numeral 10 and comprises a  
rectangular frame 11 secured to a base 12. Mounted  
within the frame 11 is a pair of rollers, 13, 14.  
Roller 13 is secured on shaft 15 for rotation in the  
10 direction of arrow A, the shaft 15 being mounted in  
bearings 16 and being driven by hand or by means of a  
motor 17 (see Fig. 9). The bearings 16 are preferably  
of the self lubricating type, or may  
comprise bushes of for example nylon or p.t.f.e. so as  
15 to require no lubrication which could contaminate the  
product, particularly in the case of pharmaceutical  
products. The roller 13 is of a resilient material or  
is provided with a sleeve 18 of resilient material such  
as rubber. The roller 14 is a stepped roller, as  
20 shown particularly in Fig. 1, and comprises at least  
two relatively large diameter portions 19 and between  
each adjacent pair of larger diameter portions 19 there  
is a relatively small diameter portion 20. The larger  
diameter portions 19 contact the roller 13 so that roller  
25 14 is driven in rotation by such contact and to provide a  
nip 21 between the two rollers 13, 14 through which the

pack 22 may pass. The roller 14 is preferably of a hard, i.e. non-resilient, material such as steel and, again in order to reduce the risk of contamination of the product, may be stainless steel or chromium plated mild steel. Roller 14 is mounted in similar bearings to those in which roller 13 is mounted and the axes of the two rollers 13, 14 are parallel. In this embodiment roller 14 is provided with three larger diameter portions 19 with two smaller diameter portions 20 therebetween, and is suitable for use with a blister pack having two rows of blisters extending therealong. A series of rollers 14 may be provided with the apparatus 10, each roller 14 being different from the others of the set in respect of either the spacing between the larger diameter portions 19 or the numbers of such portions. By interchanging the rollers 14 the apparatus 10 is readily adapted to be used with packs having different numbers or configurations of rows of blisters. For the purpose of such interchanging of the rollers 14 the frame 11 or at least one sidewall thereof may be secured by releasable fastenings, e.g. screws, whereby relatively the sidewalls are movable apart so that the roller 14 may be removed and the frame reassembled with the new roller 14 mounted therein.

At the same time a longer or shorter roller 13 may be mounted in the frame 11 if required so as to be of the

same axial extent as and cooperate with the new roller 14, and to facilitate changing of roller 13 a disengageable coupling (not shown) may be provided on shaft 15.

- 5        An inlet 23 is secured to the frame 11 through which the pack 22 is fed to the nip 21 in the direction of arrow B, the bottom 24 of the inlet 23 being substantially in alignment with the nip 21. The inlet 23 ensures that an operators fingers cannot be trapped
- 10 by the rollers 13, 14 and a plate 25 is attached to the inlet 23 so as to ensure that the pack 22 can only be fed to the rollers 13, 14 with the blisters on the upper surface. Only one plate 25 is shown whereas two or more such plates may be provided if required.
- 15        On the opposite side of frame 11 to that on which the inlet 23 is mounted there is mounted a guide assembly 26, shown particularly in Figs. 2 and 4. The guide assembly 26 comprises a mounting plate 27 and secured thereto a product chute 28 and a pack dispensing chute
- 20 29. The forward end of the chute 29 extends beyond the region of its contact with the mounting plate 27 and is slit longitudinally to provide pack guiding fingers 30 and product guiding flaps 31. The fingers 30 correspond in width and position with the larger diameter portions
- 25 19 of roller 14 and the flaps 31 similarly correspond with smaller diameter portions 20 of roller 14. Mounting plate



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27 is secured to the frame 11 whereby the fingers 30 extend towards the downstream side of the nip 21. The fingers 30 are of curved form so that a pack 22 passing through the nip 21 is constrained to travel in an upwardly curved path from the nip 21. The pressure applied to the top surface of pack 22 by roller 13 tends to depress the blisters 32 and the product therein downwardly into the space between roller 13 and the smaller diameter portions 20 of roller 14, whilst at the same time the regions 33 of the pack 22 disposed laterally of the rows of blisters 32 are constrained in the nip 21 between roller 13 and the larger diameter portions 19 of roller 14. The pressure is applied progressively along the length of the pack 22 and in consequence each blister 32 is forced downwardly progressively from its leading edge, thereby causing the product to fracture and cause tearing of the foil backing to the pack 22. This fracture and tearing is assisted by the upwards bending of the pack 22 caused by its being constrained to travel in an upwardly curved path by fingers 30.

In this way, the product is ejected from blisters 32 downwardly between fingers 30 and are guided by flaps 31 into the chute 28. The pack 22 with the fractured blisters 32 now devoid of any product therein passes down chute 29, as shown particularly in Fig. 3.

Referring now to Figs. 5 to 8 there is shown an alternative embodiment of device 50 comprising a frame 51 mounted on a base 52 and in which a roller 53 is mounted in bearings 56. In this embodiment the support means comprises a threaded shaft 54 on which rollers 59 are mounted. The left hand roller 59 is fixed on shaft 54 whereas the axial location of the other rollers 59 on shaft 54 may be adjusted to suit the spacing of the articles in the pack being processed by the apparatus. When the positions of the rollers 59 have been adjusted the locknuts 46 are tightened against the rollers 59 so as to secure that adjustment. Recesses 45 (as shown in Fig. 6) are provided in each adjustable roller 59 so that a peg spanner may be used in order to facilitate such adjustment and the locking of a locking nut 46 against a roller 59. Alternatively the adjustable rollers 59 may be provided with flats on one face thereof so that a conventional spanner may be used in this context.

As also shown in Fig. 6 the bearings 56 in which shaft 54 is rotatably mounted are movable in slideways 43 in the sidewalls of frame 51. A block 44 in each slideway 43 engages the bearing 56 so that the nip 61 may be adjusted for different thicknesses of pack, and by sliding blocks 44 away from roller 53 the nip 61 may be opened so that adjustment of the spacing of rollers 59

is facilitated. Screw or spring pressure may be applied to blocks 44 if desired so as to bias the rollers 59 towards roller 53.

Referring now to Fig. 7 there is shown the inlet 5 63, the width of which is adjustable so as to accommodate and guide packs of differing width. In this case sidewall 47 is movable relative to the opposed sidewall of inlet 63 by rotation of screw 48.

Referring now to Figs. 6 and 8 there is shown the 10 adjustable guide assembly 66 of this embodiment. The guide assembly 66 comprises a rod 41 which is secured to the frame 51. Slidably mounted on the rod 41 are guide fingers 70 to each of which a pack dispensing chute fingers 69 is attached. A screw 42 is provided 15 for each guide finger/chute finger combination so that the axial location of that combination on the rod 41 may be secured.

Referring now to Fig. 9, the apparatus 10 or 50 is shown mounted on a trolley 34, holes 35 being provided 20 in the base 12 or 52 for this purpose. The product, which may be pharmaceutical tablets, capsules or the like issue from chute 28 and pass through an aperture 36 in the top of the trolley 34 and into a drawer 37 located beneath the aperture 36. This drawer 37 may be 25 kept locked so as to prevent unauthorised collection of the product. The waste packs pass down chute 29 or 69

to a receptacle 38 for subsequent disposal. The motor 17 by means of which the apparatus 10 or 50 is driven is mounted on a lower tray 39 of the trolley 34 and the motor 17 is controlled from a control panel 40 located 5 on the trolley beneath the drawer 37.

As was mentioned in connection with the roller 14 of the embodiment of Figs. 1 to 4, the frame 11, the guide assembly 26 and the inlet 23 of that embodiment, the rollers 19, the frame 51, the guide assembly 66 and 10 the inlet 63 of the embodiment of Figs. 5 to 8 may be manufactured of stainless steel or chromium plated mild steel, or alternatively may be of a moulded plastics material depending upon the product concerned.

Alternative embodiments of apparatus in accordance 15 with the invention will be apparent to persons skilled in the art. For example the guide fingers 30 or 70 may provide the support for the pack 22 and the roller 14 or rollers 59 be dispensed with, although the embodiments shown are preferred since feeding of the 20 pack 22 is thereby facilitated. Alternatively the guide fingers 30 or 70 may be provided by endless belts whereby feeding of the pack 22 would again be facilitated.

CLAIMS

1. Apparatus for ejecting a discrete article from a blister of a blister pack in which said article is enclosed, comprising rolling pressure means operable to  
5 apply pressure to one face of said pack progressively along the length of said pack whilst said pressure applying means rolls relative to said pack, and supporting means adapted to support the opposed face of said pack at laterally spaced locations and to support said pack in a  
10 longitudinally curved configuration whilst said pressure applying means applies pressure to said pack.
2. Apparatus according to claim 1 wherein said pressure applying means is operable to apply pressure to said pack as said pack passes along a curved path in contact there-  
15 with, and said supporting means is operable to support said pack in said longitudinally curved configuration whilst guiding it to travel along said curved path.
3. Apparatus according to claim 2 or claim 3 wherein said pressure applying means comprises a cylindrical roller.
- 20 4. Apparatus according to claim 3 wherein said roller has at least an outer portion thereof of a resilient material.
5. Apparatus according to claim 3 or claim 4 wherein said roller is adapted to be rotatably driven.
- 25 6. Apparatus according to claim 5 comprising motor means adapted to drive said roller in rotation.

7. Apparatus according to claim 3 or claim 4 further comprising feed means adapted to feed said pack between said pressure applying means and said supporting and guiding means.
- 5 8. Apparatus according to any one of claims 3 to 7 wherein said supporting means comprises a roller mounted so as to be freely rotatable about an axis parallel with the axis of rotation of said pressure applying roller, and to provide a nip therewith through which said pack may pass.
- 10 9. Apparatus according to claim 8 wherein said supporting and guiding means comprises a stepped support roller having a plurality of first portions spaced apart by second portions of smaller diameter than said first portions.
10. Apparatus according to claim 9 wherein said support
- 15 roller is of a rigid material.
11. Apparatus according to claim 8 wherein said supporting and guiding means comprises a plurality of support rollers mounted on a common shaft and means adapted to locate at least one of said support
- 20 rollers at a predetermined location axially of said shaft.
12. Apparatus according to claim 11 wherein said shaft is threaded and at least one of said support rollers is provided with an internally cooperatively threaded axial bore therethrough.
- 25 13. Apparatus according to claim 12 wherein a locknut is provided in respect of the or each threaded support roller.

14. Apparatus according to claim 12 or claim 13 wherein the or each threaded support roller is provided with formations adapted to receive a spanner device.

15. Apparatus according to claim 14 wherein said formations comprise at least two recesses.

16. Apparatus according to any one of claims 1 to 15 wherein said supporting and guiding means comprises a curved plate extending towards a downstream side of said pressure applying means.

17. Apparatus according to claim 16 wherein said plate is provided with at least one slot or aperture therein.

18. Apparatus according to any one of claims 1 to 15 wherein said supporting and guiding means comprises a plurality of curved fingers mounted in spaced side-by-side disposition.

19. Apparatus according to claim 18 when dependent on claim 11 comprising means for varying the relative spacing of said fingers.

20. Apparatus according to claim 19 wherein said fingers are slidably mounted on a rod secured to a frame of said apparatus.

21. Apparatus according to claim 20 wherein each finger is provided with clamping means adapted to locate said finger in a predetermined location on said rod.

22. Apparatus according to claim 11 or any claim dependent thereon comprising means for varying the width

of an inlet to said apparatus.

23. Apparatus according to claim 22 wherein said inlet comprises a pair of opposed sidewalls at least one of which is movable relative to the other.

5 24. Apparatus according to claim 23 comprising screw means adapted to effect said movement.

25. Apparatus according to claim 8 or any claim dependent thereon wherein said pressure applying means and said support roller or rollers are mounted for relative movement  
10 towards and away from each other.

26. Apparatus according to claim 25 wherein said support roller or rollers is or are mounted for movement relative to a frame of said apparatus in which said pressure applying means is mounted.

15 27. Apparatus according to claim 26 comprising further pressure applying means operable to bias said support roller or rollers towards said pressure applying means.

28. Apparatus according to any one of claims 1 to 27 comprising a chute adapted to receive an article ejected  
20 from said pack.

29. Apparatus according to claim 28 comprising a second chute adapted to receive a pack having had an article ejected therefrom.

30. Apparatus according to claim 5 or any claim dependent  
25 thereon comprising a frame in which said pressure applying means and said supporting and guiding means are mounted, a table on which said frame is mounted and a motor mounted on